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(54) INK FOR INK JET PRINTER AND PRINTING MECHANISM THEREWITH

(57)Abstract:

PURPOSE: To obtain the title ink which cures by irradiation with ultraviolet rays and is free from blotting of a dye even when water adheres thereto after printing, by using at least water, a water-soluble dye, a specified prepolymer and a specified polymerization initiator as the constituents.

CONSTITUTION: The title ink curable by irradiation with ultraviolet rays, which contains at least water, a water-soluble dye (e.g. a cyan color), a water-soluble photo-setting resin prepolymer prepared from a monomer containing at least two functional groups (e.g. Unidic SI-929, a product of Dainippon Ink and Chemicals) and a water-(in) soluble photopolymerization initiator (e.g. Darocur 1173, a product of Merck).

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CLAIMS

[Claim(s)]

[Claim 1] Ink for ink jet printers characterized by including at least the photopolymerization initiator of water, the water-soluble photo-curing mold resin prepolymer which contains two or more functional groups with monomer structure, water solubility, or nonaqueous solubility, and water soluble dye in the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays.

[Claim 2] Ink for ink jet printers characterized [by a base solution consisting only of photo-curing mold resin oligomer, monomers, or those mixture] by viscosity being 30cps or less including a nonaqueous solubility color and a photopolymerization initiator in the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays at least into this mixture.

[Claim 3] It is the printing mechanism of the ink for ink jet printers characterized by being contained in the solution 1 with which either photo-curing mold resin or a photopolymerization initiator contains a color in printing in the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays, and creating other one side as a solution 2, and for solutions 1 and 2 being injected from a separate printer head nozzle by the same point in the printing paper, and forming a printing dot.

[Claim 4] Ink for ink jet printers according to claim 1 characterized by photo-curing mold resin having a water-soluble-dye adsorption site.

[Claim 5] Claim 1 characterized by carrying out hard facing at least by two or less amount of UV irradiation 100 mJ/cm in the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays, and ink for ink jet printers according to claim 2.

[Claim 6] Ink for ink jet printers which is a drainage system and is characterized by including a fluorine compound by the colloidal state.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Industrial Application] This invention relates to the ink for ink jet printers, and its printing mechanism.

[0002]

[Description of the Prior Art] It is regarded as the ability to become in use [a future color printer], since the ink jet printer printed by injecting liquid ink from a head nozzle consists of a compact and comparatively cheap component.

[0003] There is solid ink which dissolves a color in the drainage system ink which dissolved the color in the drainage system solvent as a color material, and the wax system solvent solidified in ordinary temperature as ink for current ink jet printers, and is injected and printed from a head where heating fusion is carried out.

[0004] Moreover, in usual drainage system ink, in order that the ink which is piling up in the head nozzle section may start blinding by desiccation, a glycerol with a water retention operation etc. is added and it is used.

[0005] On the other hand, about the ink for ink jet printers of an ultraviolet curing mold, although indicated by JP,63-235382,A, it was deficient in concrete contents.

[0006]

[Problem(s) to be Solved by the Invention] There was the following trouble in a Prior art.

[0007] 1. When using drainage system ink for color printing (for example, when the 2nd amorous glance is printed after it printed the 1st amorous glance and the 1st amorous glance dried) and the dot of the 2nd amorous glance lapped on the dot of the 1st amorous glance, the color which is the color material of the dot of the 1st amorous glance remelted with the moisture of the ink of the 2nd amorous glance, it bled, and there was a problem on which a quality of printed character deteriorates. For this reason, color printing by the ink jet method was difficult for a regular paper or recycled paper. On the other hand, although the problem of the above blots is avoidable, the solid ink of a wax system had the thick printing-on property dot of ink, became about 10-20 microns, and since it is the soft quality of the material of a wax, it has deleted the printing dot easily also by weak frictional force. That is, since scuff resistance was low, the problem was in the dependability after printing. Moreover, the ink which generally contains an organic solvent was not desirable in order to emit a solvent smell.

[0008] 2. Conventionally, when the ink for ink jets had the long period which piles up in the head nozzle section, the blinding of the nozzle by color material depositing by desiccation occurred, and it had become a problem. Although various additives have been considered as this cure, since it was required that it should have the operation which originally prevents desiccation, these were worsening the ink quick-drying after printing by one side.

[0009] 3. In the ink containing photo-curing mold resin, when the sensibility of photo-curing tended to be increased and it was going to raise hardenability remarkably, generally it could respond by increase in quantity of a reaction initiator or a reaction accelerator, but since the dark reaction at the time of preservation became easy to advance by one side, the problem arose at preservation stability.

[0010] 4. Moreover, in the ink containing photo-curing mold resin, when a pitch hardened, the color which are a pitch and color material dissociated, and there was a case described in the above-mentioned 1 where bled and the effectiveness of prevention decreased.

[0011] 5. In the ink containing photo-curing mold resin, if the exposure which usually exceeds 100 mJ/cm² in the case of hardening by UV irradiation is made, the color which generally has azo fading will advance. Therefore, when a color with azo was used, the need of hardening at least the outermost surface at least with two or less 100 mJ/cm light exposure was found out.

[0012] 6. Conventionally, once desiccation of ink took place within the head nozzle in the common ink for drainage system ink jet printers in the case of ink using an organic pigment especially as a color material, even if the pigment particle condensed and moisture was supplied, it was difficult to re-distribute.

[0013] It is in offering the ink for ink jet printers in which the place which it is and is made into the purpose has the following contents and its printing mechanism for this invention solving the above troubles.

[0014] 1. In color printing, though it is ink which contains a color as a color material by the drainage system, offer the ink which has the effectiveness that a color does not bleed after printing even if moisture (ink by printing after the 2nd amorous glance) adheres again.

[0015] 2. By using not conventional water but the prepolymer of ultraviolet curing mold resin as a base solution of ink, even if it does not add a desiccation inhibitor, offer the ink which is hard to dry within a head nozzle.

[0016] 3. In use of the ink containing photo-curing mold resin, in order to raise the preservation stability of ink, save a pitch and a reaction initiator separately and offer the printing mechanism which injects from a separate head nozzle and forms a printing dot.

[0017] 4. In the ink containing photo-curing mold resin, offer the ink using the resin to which a color molecule tends to stick so that a part for a color and a pitch may not dissociate at the time of hardening of a pitch.

[0018] 5. Offer the ink in which the color which is color material does not fade at the time of UV irradiation in the ink containing photo-curing mold resin.

[0019] 6. In the common ink for drainage system ink jet printers, when an organic pigment is used especially as a color material, the ink which can prevent the pigment condensation by desiccation within a head nozzle is offered.

[0020]

[Means for Solving the Problem] The ink for ink jet printers of this invention and its printing mechanism are characterized by including at least the photopolymerization initiator of water, the water-soluble photo-curing mold resin prepolymer which contains two or more functional groups with monomer structure, water solubility, or nonaqueous solubility, and water soluble dye in the ink for ink jet printers which has the property hardened by irradiating 1. ultraviolet rays.

[0021] 2. In the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays, a base solution consists only of photo-curing mold resin oligomer, monomers, or those mixture, and it is characterized by viscosity being 30cps or less including a nonaqueous solubility color and a photopolymerization initiator at least into this mixture.

[0022] 3. In printing in the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays, it is characterized by being contained in the solution 1 with which either photo-curing mold resin or a photopolymerization initiator contains a color, and creating other one side as a solution 2, and for solutions 1 and 2 being injected from a separate printer head nozzle by the same point in the printing paper, and forming a printing dot.

[0023] 4. Photo-curing mold resin is characterized by having a water-soluble-dye adsorption site.

[0024] 5. In the ink for ink jet printers which has the property hardened by irradiating ultraviolet rays, it is characterized by carrying out hard facing at least by two or less amount of UV irradiation 100 mJ/cm.

[0025] 6. It is a drainage system and is characterized by including a fluorine compound by the colloidal state.

[0026]

[Example]

(Example 1) The ink of a presentation (weight ratio) as shown in Table 1 was created. In addition, two sorts of ink at the time of using the case where a cyanogen color is used for a color, and an AZENTA color was created.

[0027]

[Table 1]

Photo-curing mold resin prepolymer *1 20.0 % reaction initiator *2 0.06% color *3 1.5 % water 68.44% glycerol (desiccation inhibitor) 10.0 %*1 Uni-DIKKU SI-929 (water solubility, Dainippon Ink & Chemicals, Inc. make)

*2 DAROKYUA 1173 (Merck make)

*3 The ink of the created cyanogen color was used for a cyanogen color or the Magenta color beginning.

[0028] Ultraviolet rays were irradiated after printing in a regular paper from the optical fiber installed beside head using the ink jet head using a piezo electric crystal. The exposure of ultraviolet rays was about 5 seconds, and were about 100 mJ/cm².

[0029] At this time, blue ink was hardened to the degree of hardness as which it touches by the fingertip and sufficient degree of hardness is sensed.

[0030] Then, the Magenta color was printed so that a part might lap with printing of a cyanogen color. Then, ultraviolet rays were irradiated for about 5 seconds, and hardening of the ink of a Magenta color was checked.

[0031] As a result of observing the lap part of two sorts of ink with an optical microscope, there is no trace which the color of the cyanogen color ink of the 1st amorous glance remelted by printing of the 2nd amorous glance, and has generated the blot, and it has checked the effectiveness of this invention.

[0032] (Example 2) The ink of a presentation (weight ratio) as shown in Table 2 was created.

[0033]

[Table 2]

A photo-curing mold resin monomer * 1 93.5% reaction initiator and an accelerator * 2 5.0% color (blue) * 3 1.5%*1 1:1 mixture *2 of KAYARAD-TPGDA and KAYARAD-PEG400DA (all are the Nippon Kayaku Co., Ltd. make) 3:1 mixture *3 of KAYARAD-DTEX and EPA (all are the Nippon Kayaku Co., Ltd. make) The photo-curing mold resin monomer serves as the solution base, and this ink does not contain water at all so that clearly from the presentation of oil color table 2. At this time, viscosity can become below 30cps (20-degree Centigrade), and can be printed also with the head using a piezo electric crystal component. This ink was put in in the head and left for two months. Although printed in the state of [as it is] two months after, when the blinding of a nozzle did not happen at all but the volatile low monomer was used for the ink base, it has checked that it was possible to make it hard to happen desiccation within a head by simple ink presentation unlike the case where water is used.

[0034] On the other hand, hardenability and the good thing which a blot cannot take place easily like an example 1 have been checked also about printing.

[0035] (Example 3) The ink of the presentation which extracted the reaction initiator from the ink presentation of Table 1 shown previously was created. On the other hand, only the reaction initiator was dissolved only in water and it adjusted to the concentration used as the amount of 2 double of a presentation of Table 1. However, DAROKYUA 2529 (Merck make) was used for the reaction initiator in this case.

[0036] Next, it injected on the same point from the separate ink jet head nozzle which arranged these in juxtaposition, and the ultraviolet rays of about 60 mJ/cm² were irradiated immediately.

[0037] In this device, since it became possible to increase and to make a reaction initiator react, ** Li and ink were hardened easily (UV irradiation time amount for about 3 seconds).

[0038] On the other hand, since this ink is made as separate as a pitch by the reaction initiator, having not progressed at all has obvious hardening of a pitch at the time of preservation.

[0039] Although the ink which mixed the reaction initiator of the amount of 2 double of a presentation

of Table 1 with the pitch from the beginning was created for the comparison and saved for two months in ordinary temperature (dark place), since it was the presentation with many reaction initiators, the micro gel of the resin by the dark reaction occurred.

[0040] The effectiveness of this invention has been checked the above result.

[0041] (Example 4) The ink constituent (weight ratio) shown in Table 3 was created.

[0042]

[Table 3]

Photo-curing mold resin prepolymer *1 41.0 % reaction initiator *2 1.5 % color (blue) *3 1.5 % water 46.0 % glycerol (desiccation inhibitor) 10.0 % *1 RW101A (product made from Sekisui Fine chemical)

*2 RW101B (product made from Sekisui Fine chemical)

*3 Blue5P (Nippon Kayaku Co., Ltd. make)

RW101A is a prepolymer which has the amino group to which a color (anionic) sticks in the molecular structure. As a result of printing in the ink of a presentation of Table 3, the compatibility at the time of hardening of a color and resin was very good, and phase separation did not happen at all, but blot-proof nature improved.

[0043] This result is not limited when the above-mentioned resin is used, and especially limitation will not be carried out if it is a photo-setting resin with the functional group to which general water soluble dye tends to stick.

[0044] (Example 5) Although it was the same ink presentation as the case of an example 1, light-fast weak azo dye was used as a color. Resin hardening was completed by less than two 100 mJ/cm exposure. It is before and after the exposure of ultraviolet rays, and there was that no a color fades.

[0045] Moreover, similarly, although it was the same ink presentation as the case of an example 2, the azo oil color was used as a color. Resin hardening was completed by about two 50 mJ/cm exposure.

There was that no a color fades also in this case. That is, since the ink created in the example 1 and the example 2 was hardened with two or less 100 mJ/cm low ultraviolet-rays light exposure, it has checked that it was ink of the photo-curing mold which can also use azo dye.

[0046] (Example 6) In the ink for aquosity ink jet printers which distributed the black pigment (carbon particle) with the nonionic surfactant, the aquosity emulsion (made in [MONTEKACHINI] John Boleyn EM) of a fluorochemical surfactant was added 3%. When it was left for two months, putting in this ink in a print head nozzle and printed in the condition as it is after that, the blinding of a nozzle was not checked at all. Moreover, it did not accept especially about the effect to the quality of printed character of a fluorine system aquosity emulsion.

[0047] When the test same about this ink which did not add a fluorine system aquosity emulsion at all for a comparison was performed, the blinding of a nozzle occurred.

[0048]

[Effect of the Invention] By this invention, the following effectiveness has been checked as mentioned above.

[0049] That is, since a blot of ** ink color material does not take place about the ink for the ink jet printers of a photo-curing mold, and its printing mechanism, a regular paper and recycled paper can apply as print media. (Effectiveness is especially in color printing.)

** The blinding of ink can be prevented.

[0050] ** Since the photo-curing mold pitch and the reaction initiator were saved separately and breathed out and printed from the separate nozzle even if it was photo-curing mold ink, the hardenability and the preservation stability of ink improved. .

[0051] ** Phase separation of a color and resin cannot happen easily.

[0052] ** A color's fading does not take place.

[0053] moreover, addition of a fluorine system compound -- the usual ink jet printer -- service water -- in the case of the ink especially using an organic pigment, effectiveness was acquired by blinding prevention of a head nozzle in general sex ink.

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